SCIENCE.

FRIDAY, SEPTEMBER 3, 1886.

COMMENT AND CRITICISM.

AMERICAN CANNED GOODS are being imported into France so rapidly and in such quantities as to alarm the producers of that country. As a result of this, we shall probably see a revivification of all the instances reported in the daily papers in past years of poisoning from these articles, some of which may have been due to the negligence of those engaged in the canning process, but most of which were undoubtedly due to carelessness or want of thought in the consumer. That the contents of some of the millions of cans annually put up for market in the United States should spoil is not to be wondered at, inasmuch as every housewife has the same experience in her domestic preserving; but in most of the instances where sickness has occurred from the consumption of such foods, the color or the taste gave ample warning.

IT IS DEEPLY TO BE REGRETTED that the work of the summer corps of the New York health department was not carried on this year, as heretofore. The amount of money which was asked of the board of apportionment was $10,000, the same as in past years; but for some reason, which was undoubtedly satisfactory to that body, although exceedingly unsatisfactory to the general public, the amount was not allowed, and the poor children of the metropolis have suffered accordingly. In 1885 this corps, consisting of 50 physicians, entered 28,178 houses of the tenement class, visited 13,410 families, and actually treated 3,934 cases of sickness which would otherwise have gone through their illness, either to recovery or death, unattended by any physician. Inasmuch as 1,850 of these cases were of a diarrhoeal nature, the probability of a fatal termination in the majority was very great: 291 children were found affected with contagious disease, and the necessary steps to isolate and disinfect were carried out, — a sanitary supervision which would not have been exercised had this corps not been on duty. Besides all this good work, there were distributed 11,579 circulars giving directions to poor and ignorant mothers as to the care of their infants, and 5,000 tickets distributed, each guaranteeing its holder a day on the water under the refreshing influence of the ocean breezes. That such work as this, affecting as it does the lives of thousands, should be left undone in a great city like New York, where tens of millions are annually spent for the maintenance of the city government, to save a paltry $10,000, or, what is more likely, to satisfy some personal or political grievance, is little less than criminal. Brooklyn, during the past year, had the services of a volunteer summer corps, and this year has put in the field a paid corps, which is doing excellent service. The action of New York is only paralleled by that of the United States toward the National board of health.

PROFESSOR LEMAISTRE of Limoges describes a new disease which is at the present time quite prevalent among the school-children of France. It is known among the common people as *perléche*, and is contagious. It consists in an abrasion in the corners of the mouth, which become little ulcers and sometimes bleed: it lasts from two to four weeks. The description given of it corresponds to what is commonly called in this country a 'cold-sore' or 'fever-blister.' In the sore Lemaistre has found a microbe which he calls Streptococcus plicatilis. These have been found in drinking-water, and it is surmised that they have been transferred to the lips of a person, thence to the edge of a cup, and thus all who used the cup became affected. Professor Lemaistre has examined the 5,500 children who attend the 32 schools of Limoges, and has found 312, or 1 in 17, affected with this disease. Although Professor Lemaistre is connected with the Ecole de médecine of Limoges, his explanation is to be accepted with a good deal of caution. It is hardly probable that a new disease has been discovered, or that its method of propagation can be so easily explained. The difficulties surrounding the demonstration of the connection between microbes and disease are so great, and the men competent to trace the various steps in the process so few, that we shall feel compelled to wait for further evidence before we accept *perléche* as a new disease, and this variety of Streptococcus as its germ.

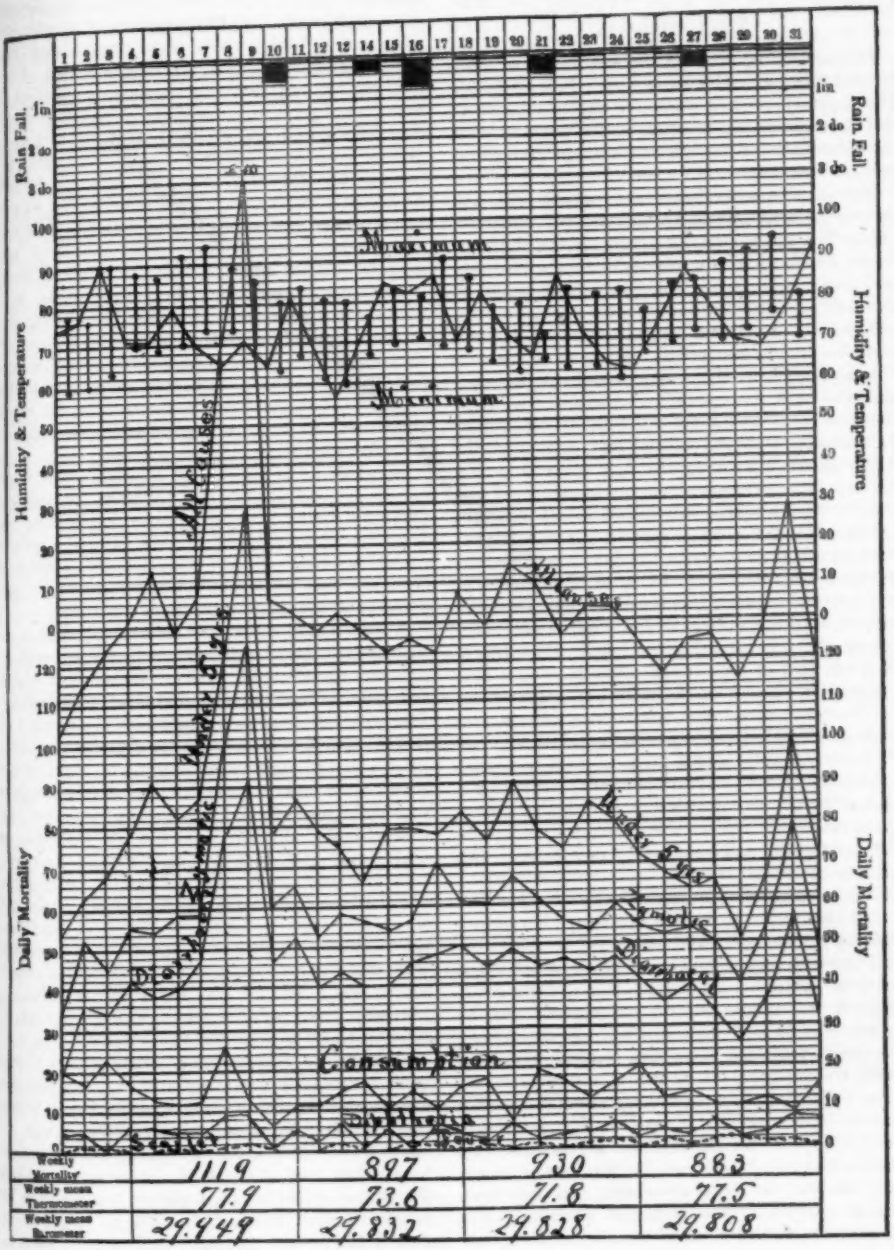
THE HEALTH OF NEW YORK DURING JULY.

THE month of July has the highest mortality of the year, its deaths running up to the startling figure of 4,198, an excess of 1,436 deaths over the month of June. This represents a daily average throughout the month of more than 135. The 8th of the month was characterized by the greatest daily mortality, 240, which has occurred since 1886 set in, and it is more than probable that this will not be exceeded during the entire twelve months. More than one thousand of the monthly increase was due to diarrhoeal diseases; and, of children under five years of age, 1,125 more died than in the preceding month. If this fact is borne in mind in reading the remarks made elsewhere on the failure to provide funds for the summer corps of physicians to visit the tenement houses, the gross outrage of this neglect will be better appreciated. The sudden and fearful rise of the mortality curves as represented in the chart is very striking. It will be remembered that in the early part of the year the lines of scarlet-fever and diarrhoeal diseases were so nearly coincident that at times they could not be distinguished, and that attention was then called to the fact, that, as summer approached, these lines would gradually separate, until in midsummer we should find them at a great distance from each other. That time has come: while scarlet-fever has on no one day of July caused more than two deaths, in one single day, the 8th, 92 persons succumbed to diarrhoeal diseases. Consumption caused 439 deaths, an increase of 6 over the preceding month; and diphtheria, 133, but 3 more than in June.

July was a month in which the temperature did not vary much from the average of the past ten years. The mean was 74.83° F. During the past decade this was exceeded six times. The maximum was 94° F. This was reached on the 7th at 3 P.M., and again on the 30th at 4 P.M. In July of 1885 the mercury touched 99, the highest since 1870. Rain fell on thirteen days of the month, but only to a slight extent, except on the 10th, 14th, 16th, 21st, and 27th; and the total rainfall for the month was but 2.75 inches, the lowest for ten years with the exception of 1881, when but 1.25 inches fell.

THE COMMITTEES OF THE AMERICAN ASSOCIATION.

THE reports of the committees of the American association were in general as unsatisfactory this year as heretofore, notwithstanding the new rule that all committees not reporting should be discharged. The usual report in regard to progress in obtaining proper legislation on the registration of births, deaths, and marriages, was made by Mr. E. B. Elliott, which amounted to little more than stating that Mr. Elliott had conferred with several members of congress. No one doubts the desirability of such registration in this country, and every one must hope to see it carried into effect at some not distant day. The committee on standards of stellar magnitudes stated that they had received reports of some observations made in compliance with the requests of last year; but, as some of them are still incomplete, it is deemed best to extend to July 1, 1887, the period within which the results may be received at the Harvard college observatory. Nothing could be stated by the committee on the International scientific congress; but the committee was continued, and it is hoped that some action will be taken at the meeting of the British association now in progress. The report on indexing chemical literature is referred to under our account of the meetings of that section. The committee on the International congress of geologists reported the proceedings of the Berlin meeting, and announced a fourth to be held in London in 1888. It asked authority to add the name of the association to an invitation to hold the next session in this country. The committee on anatomical nomenclature was continued, and Dr. Frank Baker was appointed in place of Dr. Leidy, ineligible on account of not being a member. The committee on health and diseases of plants was discharged as having accomplished its object. The committee on postal laws in regard to transmission of biological specimens through the mails reported with a copy of a petition to the postmaster-general, and of a proposed law which failed to pass the late session of congress. It is interesting to note in this connection the recent experience of a member of the Entomological society of Belgium, M. de Selys. M. de Selys found it necessary, when he sent to a friend in America some specimens, to fill out blanks in triplicate, stating that he sold these specimens to his friend in America at a given price. It was only after considerable correspondence back and forth with the authorities in Belgium that this method was adopted as the only one by which the specimens could be passed through the American custom-house. The committee on physics-teaching reported that they deemed it desirable that no formal report should be made until they could confer with a corresponding committee of the International educational association. The other committees were discharged according to the rule. Among the proposed amendments to the constitution was one substituting the word 'council' for the words 'standing committee.'


Rain Fall.
Humidity & Temperature
Daily Mortality
Maximum.
Minimum.
Diarrhœal
Bronchitis
Consumption
Weekly Mortality
Weekly mean Thermometer
Weekly mean Barometer
1119
897
930
883
77.9
73.6
71.8
77.5
29.449
29.832
29.828
29.808

PROCEEDINGS OF THE SECTION OF ANTHROPOLOGY.

This section is, perhaps, the one that is of most general interest, and was, as usual, well attended. The papers presented were of a varied character, and an encouraging increase in the consideration of what may be called 'psychological anthropology' was noticed.

One of the most important papers was presented by Dr. Daniel G. Brinton of Philadelphia. The paper had for its object the determination of the phonetic elements in the Mexican and Maya languages. The European conquerors found these races familiar with the art of writing, and possessing volumes of tradition, besides stone and hard-wood inscriptions. In spite of destruction and neglect, there are enough of these remains to form a respectable *corpus inscriptionum Americanum*. The important question concerning the languages of the Mayas and Aztecs is, To what extent were they phonetic systems? Did they appeal to the meaning, or the sound, of the word? In answering this question, one must remember that the arrangement to the eye of phonetic symbols is an arbitrary one, and that the sound represented may be a word, a syllable, or a sound-element. One must not approach the subject with the expectation of finding any usual arrangement, but must remember that the orders of space and of time do not agree. Some languages are read from right to left, others from left to right; some from above downwards, and some alternately from left to right and the reverse. The only requisition of a phonetic system is that a written symbol shall in some way represent a spoken sound or combination of sounds. Naturally, the most frequently occurring sounds will be the ones most apt to acquire a symbol. The process by which they do so is quite similar to that by which the Cherokee Indian Se-Quo-Yah gave to his nation a written alphabet. He simply listened for the syllabic sounds used by his tribe, and had each represented by a single symbol, taken from or suggested by an English spelling-book. Suffixes and affixes very naturally would soon be represented by a written symbol. In examining the Maya language from this point of view, one finds, for example, the picture of the sun with its rays, indicating the sound of its name (*kin*). We find in the expressions for 'east' and 'west' (*lakin* and *chikin*) that the final syllable is represented by the sun-picture. Turning to the Mexican language, our material is more abundant, and has been better utilized. This language (*Nahuatl*) was thoroughly studied by the Catholic priests. They found that the native phonetics were partly syllabic and partly alphabetic, somewhat as though one would write 'cat' by a picture of a chair, an axe, and a table, each sign representing the initial sound of its name. It is known, that, of the five vowels and fourteen consonants composing this language, three vowels and probably three consonants had reached the stage of being expressed by simple letters: *a* was represented by the sign for *atl* (water); *e*, by *etl* (bean); *o*, by *olli* (footprint); *p*, by *petl* (mat) or *pau* (flag); *t*, by *tetl* (stone) or *tentle* (lips); *z*, by *zo* (lancet). These are exceptions, however, and many phonetics are syllabic. What may be called the 'rebus' mode of writing is, however, the characteristic one. The lover who wooed his bride by sending his message in the form of the picture of a rose, a low mound, an eye, a loaf of bread, and a well, meaning 'Rose Hill I love well,' was going back to the language of the ancient Mexicans. In the Mexican form the order of the rebus signs was immaterial.

In addition to the above illustrations of what can be accomplished in this direction, Dr. Brinton presented some interesting results obtained by Mrs. Nuttall Pinart, and closed with a plea for the scientific study of this group of languages, and the assurance that many unique aspects of the problem of language were there concealed.

A novel and ingenious method of getting an insight into the unconscious mechanism of authorship was described by Mr. T. C. Mendenhall, under the title 'Characteristic curves of composition.' The method consists in counting the number of words of each length, from one letter to fourteen, fifteen, or as long as were found, and plotting the result on a curve, in which the abscissae represented the number of letters in the word, and the ordinates the number of words per thousand of each length. It was shown that while the curve resulting from each thousand words was not entirely regular, that resulting from five thousand was much more regular, and that from ten thousand almost entirely so. The inference from this was, that the phenomenon which the curve represented was a regular one, and that it was an expression of the peculiar vocabulary of the author. Moreover, by comparing the respective curves, one would be able to judge whether two works were written by the same author, and perhaps even decide the controversy whether Bacon wrote Shakspeare. Mr. Mendenhall's method was to count a thousand words at a sitting, and then turn to another part of the book. One soon acquired the art of counting at a glance the number of letters in each word, and, with an assistant to record the result, one thousand words could be counted in a half-hour. Curves derived from

Dickens ('Oliver Twist') and Thackeray ('Vanity Fair') were remarkably similar, thus suggesting that the subject-matter might cause the peculiarity of the curve, while those from John Stuart Mill ('Political economy' and 'Essay on liberty') differed from them in having more long words and fewer short ones, though words of two letters (prepositions mainly) were most abundant in Mill. The average length of the novelist's words was 4.38, and that of the philosopher 4.8.

In the discussion following this paper it was suggested that perhaps the characteristics of the language might be thus represented, and that, before describing certain characteristics as peculiarities of authorship, one must show that they are not due to the language, to the subject-matter, to the form or the fashion. Mr. Mendenhall's method is highly suggestive, and some interesting applications of it may be expected.

Mr. F. W. Putnam presented an interesting communication exhibiting photographs of specimens which show the method of making bone fish-hooks. These specimens and the hooks came from mounds in the Little Miami valley. They show that the process consisted in first boring a hole in the bone at the point which was to form the bottom of the bend of the hook. A cut was then made to either side from this hole, forming the inner surface of the hook, which was completed by rubbing down the piece into shape. Pieces of bone at each stage of the process have been found.

Rev. J. Owen Dorsey gave an account of a secret organization among the Osage Indians, the knowledge of which was obtained by gaining the confidence of some of the members. Similar societies can also be traced among the Kansas and Poncas. There are also close analogies with the Omaha dancing societies, in which secret observances are closely interwoven. There are seven degrees in this secret society. The first is called *Ni-k'ü-wac-u*, 'Songs of the giving of life.' The others are as follows: 'Songs of the bird, or dove,' 'Songs of the rushes,' 'Songs of the sacred bag,' 'Songs of the pack-strap' (the name of the sixth is forgotten), and, lastly, 'Songs of the return from war.' The initiation of a woman consists in her reception by the head of the gens, who makes her take four sips of water, emblematic of the river flowing by the tree of life. Cedar twigs, symbolizing the tree of life, are then rubbed between his hands, after which he strokes the woman from head to foot twelve times, — that is thrice in the direction of each of the four winds, — pronouncing the sacred name of a higher power each time that he rubs her with the cedar. The candidate is also tattooed with the round spots on the forehead among the Osages; but one such spot is given among the Omahas and Poncas. The initiation fee is a dozen horses, two copper kettles, several hogs, and a bountiful supply of beef for a feast, of which all the members partake. Each gens of the tribe has a mythical tradition of its origin, which is chanted by the old man who acts as priest. It takes four days and nights to chant the entire tradition of any one gens. Parts of these traditions Mr. Dorsey was able to record. One translates thus: "The first of the race was saying 'Ho, younger brother! the children have no bodies. We shall seek bodies for our children. Ho, younger brother! you shall attend to it.' They stood for the first time on the first upper world. There they were not human beings. One was saying 'Ho, younger brother! the children have no bodies. We must seek bodies for our children.'" Mr. Dorsey showed the chart on which the various designs which are interpreted symbolically were represented. The peculiarity of the symbolism there represented, and yet its general resemblance to similar European customs, is a strong evidence of the fact that the human mind everywhere works in the same direction. Other traditions and customs were given by the author, which brought out the high moral and political instincts of the Osage Indians.

Professor Edward S. Morse made additional contributions to his study of ancient arrow-releases. After describing the evolution of the release by the way of five stages, the last two of which represented the strongest phases, and are still in use, especial stress was laid on the fact that amidst all the change of religious rites, social customs, political organization, and so on, the apparently trivial act of slipping the arrow from the bow has remained unchanged. The persistency of this custom is in contrast to almost all other similar habits. Methods of release practised to-day may be traced back as far as three thousand years.

Mr. J. W. Sanborn related his observations upon the Iroquois league. The league was founded mainly on the law governing intermarriage. A warrior in one clan could marry only with certain other clans. The chief always ruled over his mother's clan, and did not succeed his father. The speaker affirmed that the league was in existence long before the days of Columbus, and was enthusiastic in his opinion of its efficiency.

Mr. H. C. Stone described the 'Eyah Shah, the sacrificial stone of the Dakotas.' The Dakotas worship the bowlders scattered among the hills, and expect to be aided by them in times of distress. But the peculiarity of the 'Eyah Shah' was that it was a place of worship from year to year.

The name means 'red stone.' The stone is a specimen of hornblende, but not red in color. It is decorated by means of a painted design.

Dr. John C. Branner presented some notes on a Brazilian language. The language, which is unlike any other Brazilian tongue, is spoken by a small and rapidly disappearing tribe in the province of Pernambuco. Some of its peculiarities are the use of a dual number; the grammatical distinction between objects belonging to the speaker and those belonging to others; the position of the accusative case at the opening of the sentence; the absence of labial sounds (due perhaps to the use of lip ornaments); and the presence of several sounds not found in the Portuguese language.

Mr. George F. Kunz read a paper on four gold and five silver ornaments from mounds in Florida. One of the gold ornaments weighed 75½ pennyweights, another 60, and two 19½ and 10 pennyweights each respectively. For North American gold-finds they are remarkable. They were suggested to be of Georgia gold origin. An eight-inch ornamented circular shield of gold, a very elaborately ornamented wire gold nose ring and other gold objects from the United States of Columbia, were also described.

At the last meeting of the section the members were agreeably surprised by the startling paper of Mrs. Nuttall Pinart, containing some analyses of Mexican inscriptions. The great novelty of her interpretation consists in interpreting the Mexican symbols as phonetics and not as ideograms, thus completely revolutionizing the current conceptions on this subject. Her method has been applied to the deciphering of certain calendar and sacrificial stones of Mexico, and was suggested by the presence on these of certain phonetic symbols occurring in picture-writings. This so-called calendar stone Mrs. Pinart believes to be the market stone of the City of Mexico. It regulated the times of holding the market days; and perhaps the division of the Mexican year rested upon these times. It also gives evidence to the existence of a communistic government. The means by which these striking results have been obtained can be illustrated by the following case. From the words *tetl* ('stone') and *isctli* ('face' or 'surface') and *pan* ('upon') we obtain, by combination according to the rules of the Nahuatl grammar, the word *teiscpan*, meaning 'publicly,' the name of which, *teiscpanca*, means 'something evident and manifest to all.' Dr. Brinton, who read Mrs. Pinart's communication, remarked upon it, that it was of epoch-making importance, and that if, as is probable, her method should be justified, we will have a new key for unlocking the mysteries of Mexico. It may be well to add that this rebus-writing was an artificial system used by the priests, and that the solution of the problem consists in showing that this secret writing, read as a combination of phonetics, becomes intelligible as a piece of Nahuatl language; just as though a secret language were made by using words the several parts of which formed other words, e.g., 'carpet' would be the picture of a car and of a pet.

The section was much interested in Professor Putnam's general sketch of the recent progress and significance of mound excavations. The usual view that regards all mounds as nearly identical in character and origin was discountenanced, and, in opposition, it was held that only a careful and detailed examination of a large number of mounds would supply the requisite data for a consistent picture of the mound-builders and their works. Nor are we justified in regarding the single characteristic of mound-building as a sufficient basis for considering the builders as belonging to the same race. The character of the mounds, their contents, their apparent purposes, all force upon us the conclusion that we are dealing with different anthropological races and with peoples of different times. One can even find mounds which seem to have been used for a second time while the first mound had been forgotten or at any rate ignored. So, too, with the question of age. Some mounds are evidently of recent origin, while others form a group which may be called ancient. Professor Putnam illustrated his remarks by off-hand sketches of the plans of various mounds which have been excavated under his direction and that of Dr. Metz, in the Lower Miami valley.

On the whole, the organization of the section of anthropology leaves much to be desired. Its popularity is at once a good and an evil; its good consists in attracting general attention to the variety and importance of the problems connected with man; its evil, in that this variety and interest are apt to give admittance to papers of too vague and pointless a character, which have no place in the sciences and neither bring nor suggest any thing new. It is the section that more than any other needs to be conducted on a strictly scientific plane, because its subject-matter is more open to a non-scientific treatment. There is no reason why this section should not be made to represent the high-water mark of American scholarship in the many interesting sciences that centre about anthropology.

THE American association unanimously passed a resolution expressing its gratification at hearing of Dr. Gould's proposed revival of *The astronomical journal*, and its good wishes for its success.

PROCEEDINGS OF THE GEOLOGICAL SECTION.

THE geological interest of the meeting at Buffalo naturally centred in the excursion to and discussion of the falls and gorge of Niagara. Dr. Pohlman of Buffalo described the district to be visited on Saturday, and called particular attention to the occurrence of drift-filled antecedent channels on the line selected by the post-glacial overflow of Lake Erie, which would greatly diminish the amount of rock-cutting required in the excavation of the present gorge, and thus reduce the time since the overflow began: indeed, he thought, that, while there may have been rapids in the course of the early Niagara, near the Lewiston margin of the limestone plateau, in which the gorge is cut, the limestone was there so thin, and the shales below it so weak, and branching antecedent channels guided so great a length of the gorge from the plateau margin towards the present falls, that no great cataract was formed until the gorge was cleaned out even as far up as the older suspension-bridge. This would leave but a small amount of deep, hard rock-cutting for the falls to accomplish, and would thus make their beginning much more recent than has generally been supposed.

The geological members of the excursion party therefore gave close attention to these matters, and, as a whole, regarded the heavy drift between the sloping, rocky banks at the whirlpool, and the wide, open valley, with its plentiful drift, at St. David's, as sufficient evidence of an old buried channel connecting these points, and probably heading up above the whirlpool towards the bridges. But there seemed no sufficient reason for any confident belief in a branching old valley from the whirpool towards the Lewiston bluffs: in making this lower part of the gorge there must have been a long period of deep rock-cutting between the first leap of the falls over the bluff and the time of their discovering the old drift channel at the whirlpool. It should be noted that Professor Claypole reported the finding of a ledge of limestone, not seen by the rest of the party, in the drift slope at the whirlpool, which would suggest a less depth for the old valley than was generally accepted. Some antecedent channelling of the rocks was, however, certainly accomplished before the Niagara began its flow, and the washing-out of the drift that filled the old channel was easy work for the river; but by far the greater part of the gorge still seems to be the original work of the falls in solid rock.

The estimate of the age of the falls was presented by Messrs. Woodward and Gilbert of the geological survey, and their remarks greatly interested a large audience that had gathered on the announcement of the discussion. Mr. Woodward had just completed a survey of the Horseshoe Falls, and by comparing his results with those of the state survey in 1842, and of the lake survey in 1875, he found an average recession for the whole face of the fall of about two and four-tenths feet per annum; but, as the central parts of the curve where the water is deepest has retreated from two hundred to two hundred and seventy-five feet in the eleven years since 1875, an average retreat of five feet per annum does not seem at all improbable. Mr. Gilbert then discussed the beginning of the falls as controlled by the drainage of the lakes. When the retreating ice-sheet stood so as to obstruct the St. Lawrence and Mohawk drainage channels to the east, a broad sheet of water, representing a confluent of Erie and Ontario, stood at a high level over the present Niagara limestone plateau, and probably drained south-westward to the Ohio. When further melting opened the Mohawk Channel, the great double lake fell to a lower level, and was separated into its two members, Ontario sinking to the level of its outlet at Rome in central New York, but Erie being held higher by the rim of the Niagara plateau. This was the birth of the river and the falls, and since then they have been at work on the gorge. The age of the falls thus carries us back to a tolerably definite point in the decline of the glacial period.

On the supposition of a uniform rate of recession, the age of the falls equals the length of the gorge divided by the annual recession; but the rate has been undoubtedly varied by changes in a variety of conditions, which must be allowed for. As thus qualified, Mr. Gilbert gave it as his conclusion that the maximum length of time since the birth of the falls by the separation of the lakes is only seven thousand years, and that even this small measure may need significant reduction.

Mr. A. A. Julien, in a paper on 'Methods of testing building-stones for absorption, freezing, and fire,' gave what he considered the proper conditions for such testing, and maintained that the tested stone should be continued under pressure at least a month. He stated that frost was found to be more active in removing particles that had been loosened by chemical weathering than in direct mechanical breaking of unweathered rock. Mr. J. C. Branner reported that he had found glacial striations over the summits of some mountains examined by the Pennsylvania geological survey, so that no direct measure of the maximum thickness of the ice can be determined from this region. It is interesting to note in this connection

that Professor Branner and others following him, in a discussion of the scheme of map colors adopted by the International conference of geologists, took occasion to severely criticise the scheme proposed as being too rigid, and wanting in adaptability to new regions. Among the other papers of note, we would call attention to the following: 'The geological features of a district in south-western Colorado,' by Dr. J. B. Comstock; 'The outcrop and thickness of the Tully limestone in the neighborhood of the finger lakes of western New York,' by S. G. Williams; 'The molluscan fauna of the New Jersey marls,' by R. P. Whitfield; 'A revision of the Cayuga Lake (New York) section of the Devonian,' by H. S. Williams; 'A process of mechanical deformation for the Connecticut valley triassic formation,' by W. M. Davis; 'Work in Nebraska,' by L. E. Hicks; 'Our cretaceous flora' and 'Our Devonian and carboniferous fishes,' by Professor Newberry; 'Fossil wood from Ohio,' by Professor Claypole; 'Geography and topography of the head of Chesapeake Bay,' by W. H. McGee; 'Holyoke trap range,' by B. K. Emerson; 'Some dynamic effects of the ice-sheet,' by F. J. H. Merrill.

PROCEEDINGS OF THE SECTION OF CHEMISTRY.

Professor Wiley prefaced his vice-presidential address by announcing the much-to-be-regretted death of William Ripley Nichols, his predecessor as chairman of the section.

W. H. Seaman, who, with A. C. Peale and C. H. White, forms a committee of the chemical society of Washington for the purpose of bringing about uniformity in the methods of stating water analyses, read a report upon this subject, and desired the approval of the section for the method recommended. After much debate, the matter was referred to a committee of the section, consisting of Professors Caldwell, Langeley, Myers, Mason, and Warder, who are to report another year what action is desirable.

Miss Helen C. De S. Abbott read a paper upon the proximate composition of a bark from Honduras, known as 'chichipati,' which contains a new camphor and a yellow coloring-matter, chichipatin, apparently of value as a dye and substitute for fustic. The same author also presented some considerations of the relations of the chemical constituents of plants to their morphology and evolution, believing that the chemical constituents follow parallel lines with the evolutionary course of plant forms, the one being intimately connected with the other, and the height of the scale of progression being indicated by these constituents, which are therefore appropriate for a basis of botanical classification.

H. C. Bolton, of the committee on indexing chemical literature, after presenting their report showing the large amount of valuable work which was being done, read a paper on the confusion which exists in the abbreviations employed in chemical bibliography, and the desirability of uniformity in designations of scientific periodicals.

C. F. Mabery's paper on the products of the Cowles electric furnace was of particular interest, and attracted much attention. He stated that the past year had been devoted more especially to the development of an increased commercial efficiency of the furnace, so that now three hundred horse-power could, by means of a large dynamo, be applied with greater economy in the results; and by coating the charcoal employed in the furnace with lime, by soaking it in lime-water, the production of graphite was largely avoided and a marked improvement in the working of the furnace introduced. The results — although, as compared to what would eventually be accomplished by electric smelting, they may seem crude — have reached a stage where their commercial success can be demonstrated.

It was also found that when the electrodes entered the mixture in a slanting position the product was increased. They are now also moved in and out with advantage, being gradually withdrawn as the resistance falls. Professor Mabery replied to the criticisms of Hehner of Berlin, Siemens, and others, that no new principle was involved, showing that the Cowles furnace is quite different from all hitherto constructed, and the only one of practical application by which a dynamo of three hundred horse-power could be used, as by means of a resistance-box and the arrangement of the furnace the sudden breaking of the current is prevented from burning out the dynamo. The presence of copper for the reduction of aluminium was shown to be unnecessary; and, by complete exclusion of air from the furnace, buttons of the metal were easily obtained. A product which has attracted considerable attention during the past year is obtained by reducing aluminium in presence of iron. A cast iron is formed containing sometimes as much as ten per cent of aluminium, and this product is used to facilitate the working of crude iron and to introduce into the various grades a small percentage of aluminium. In the reduction of aluminium in the presence of copper, a yellow product is frequently taken from the furnace which is composed of metallic aluminium to the extent of one-half or three-fourths, the balance being silicon and copper. It is also formed in the absence of

copper, and then contains a higher percentage of aluminium, and always contains nitrogen. It has a resinous lustre, and decomposes water at 100°.

A paper by Clifford Richardson, on some constituents of the embryo of wheat, showed the unexpected presence of a soft wax, cane-sugar to the amount of more than ten per cent, a new saccharoid, and allantoin, a nitrogenous substance of the uric acid series, together with other similar substances not yet isolated. The relations of these substances to the transfer of nitrogen in the plant were discussed.

William McNurtrie described the chemical examination of specimens of ropy milk and cream, which description, together with the discussion which ensued, showed that this unfortunate condition is brought about probably by some organism, and that cleanliness and disinfection are the best means of prevention.

The poisonous matter sometimes occurring in old cheese and ice-cream, which he has named 'tyrotoxicon,' was described by V. C. Vaughan. He showed it to be of ptomaine nature, and had been able to induce its formation in a mixture of milk, sugar, and eggs, by inoculation with a small portion of ice-cream which contains the poison. This would seem to point to its origin in the growth of some microbe. Its toxic effect is shown in the extremely rapid production of symptoms similar to those observed in cholera infantum.

Thomas Taylor presented an exposition of his views on the characteristic differences in fat crystals, which have already attracted considerable notice in print, and are well known to most of our readers.

Other papers read were as follows: 'Action of heat on ethylene,' by L. M. Norton; 'A new viscometer,' by S. M. Babcock; 'Method for the determination of the melting-point of fats,' and 'The areometric method of estimating fat in milk,' by H. W. Wiley; 'Manufacture of sodium carbonate,' by Adolf Kayser, presented by Alfred B. Young; 'Substituted acrylic and propiaric acids,' by C. F. Mabery; 'Determination of caffeine,' by Dr. Hodgson Ellis; 'Composition of soiling rye,' by William Frear; 'Preliminary analysis of leaves of Juglans nigra,' by Lillie J. Martin; 'Some laws of chemical union,' by C. F. de Laudero and Paul Prieto, read by the secretary; and 'The torsion analytical balance,' by A. S. Springer.

AN exhibition of apparatus for the destruction of parasites of cultivated plants will be held at the Horticultural school in Florence during October.

PROCEEDINGS OF THE SECTION OF PHYSICS.

THE first matter presented to the section was a recently devised instrument, by Mr. John A. Brashear, which he terms a 'gravity parallelometer. It is used in making the surfaces of a plate of plane glass truly parallel. The art of executing a single plane surface has been carried to a very high degree of perfection, but peculiar difficulties are encountered in making two surfaces parallel. By Mr. Brashear's method a variation in thickness of $\frac{1}{80000}$ of an inch can be detected. In one case, two surfaces about a quarter of an inch apart were made so nearly parallel, that, were they extended, they would not meet in five miles.

Prof. W. A. Rogers described the combined yard and metre, which will be used by the department of standards of the British board of trade in a definite determination of their relative lengths. The latest value of the metre in English measure is 39.37012 inches.

Prof. J. W. Sanborn has been for several years experimenting on the relation of dew to soil-moisture. One means of investigation has been to weigh prepared portions of soil night and morning. His conclusion is, that, except in rare cases, the idea that the soil receives moisture at night is false, and the contrary is really true. This applies where there is no vegetation.

Major H. E. Alvord presented the results of extensive temperature observations at Houghton farm relative to dew formation. Thermometers were placed so as to determine the temperature from several inches below the surface of the ground to about four feet above the surface. The results, from observations during several months in the summer of 1884, show that the minimum temperature during dew formation is about four inches above the ground, which was not unfrequently six or eight degrees lower than the temperature at the surface. The temperature at the surface was less than the temperature several inches lower. Some surprise was expressed at these results, and the dew problem was regarded as still more perplexing. The temperature of the surface on which the dew is formed is an essential factor in the solution. Discussion showed the difficulty in determining the exact temperature of the surface particles, which differs from that of the earth above or of the soil below, and the total inadequacy of the mercury thermometer as a means of determining it.

Prof. T. C. Mendenhall prefaced his paper on electric thermometry by saying that the strictures upon the mercurial thermometer should not be

carried too far. It has been of great value, though it may now fail to meet new demands. Electric thermometry is receiving especial investigation at the signal office, particularly from the meteorological stand-point, with some promising results. Professor Mendenhall reported the progress which had been made in the study of atmospheric electricity during the past year. It is not time to begin to think of the origin of atmospheric electricity. The problem is its distribution and the relation, if there be any, to weather changes. Some very interesting results have been reached. In ordinary weather the electrical condition is undergoing constant and rather wide variations, which are very local, as two collectors only a few feet apart may give curves differing considerably, though similar in their wider variations. When an electrical storm occurs, the curves over a wide area may be similar in general outline.

Professor Mendenhall also noted a phenomenon entirely new to him; namely, that resistance coils, after a current is passed through them for some time, upon short-circuiting, will yield a reverse current for hours. This phenomenon can no doubt be classed under the general head of polarization, yet by simple polarization it would be difficult to account for persistence of current. This makes caution necessary in the use of resistance coils, in order that any effects of this kind may be carefully noted. In one instance the apparent resistance of a coil was found to increase fourfold when the current was reversed.

Prof. W. A. Anthony reported the results of experiments showing an increase in the torsional elasticity of metallic wires. In the case of a certain phosphor-bronze wire, it has been increasing, at a decreasing rate, for nine months. Various metals have been investigated. Steel is scarcely better than brass and other substances, and they all show a much wider change than the bronze. To determine whether the phenomenon is dependent upon the age of the wire and the condition to which it is subjected, a piece of wire was freshly drawn. A portion forty centimetres long was used in a torsion pendulum. The period changed from 9.575 seconds to 9.526 seconds in four days. The curve representing the time of vibration shows that the change occurred less rapidly each day. Another piece of the wire, which had been drawn at the same time, and which had been subject to no strain of any kind, was then tested. The curve for this wire was not a duplication, but was almost an exact continuation of the former curve, showing that the same changes had been going on in the two wires. The temperature co-efficient seems to change with the change in torsional elasticity.

The following papers were also presented: 'Counteracting the effect of change of level of the torsion balance,' by Prof. Wm. Kent; 'Time of contact between the hammer and the string in a piano,' by Prof. C. K. Wead; and 'Registering small variations of speed of machinery,' by Prof. W. A. Anthony.

PARIS LETTER.

M. Pennetier, at a recent meeting of the Academy of sciences, gave the results of experiments of fourteen years' duration concerning the revivification of small animals, such as rotifers and Anguillula tritici, after a protracted state of apparent death due to dehydration. The results are the following: Anguillulae, which M. Pennetier had kept, year after year, in a state of apparent death and in great numbers, have ceased to be subject to revivincation, upon being put in moist conditions, after fourteen years. Up to this date, they regained movement and life easily enough, but after it none of them could be brought back to life. M. Vulpian remarked, *à propos* of M. Pennetier's experiments, that he had noticed that every year the number of dehydrated animals that can be recalled to existence decreases regularly, and that most likely the process of desiccation works in the animals some progressive alterations of an unknown nature, which lead to results incompatible with life. M. Vulpian argues also that it cannot be death that desiccation induces; it can only be some sort of lethargy during which life-phenomena and manifestations are at the lowest. This conclusion will be indorsed by most biologists.

This question of the revivification of desiccated animals was treated in a very interesting manner some twenty-five years ago by Broca. Leuwenhoeck was the first who noticed the fact, and Needham and Henry Baker (1743), Spallanzani and Fontana, soon followed. During the present century, Doyère, Pouchet, and Davaine investigated the subject with great care. They found that the facts were quite true; but while Pouchet, following Leuwenhoeck, believed that there was no real death in the case, and that it was only a very good imitation of it, Doyère, following Spallanzani, believed that the desiccated animals were really dead, and that their revivification was a real resuscitation, a new creation of life. In 1860 a committee was appointed by the Société de biologie for the purpose of investigating the question. Brown-Sequard, Balbiani, Berthelot, Dareste, and Robin were members of this committee: Broca had charge of summarizing the results and drawing up the report of the committee. This report was published in 1860, and it remains one of the

most accurate statements, and the most scientifically written papers on the subject. After a long series of experiments, the conclusions obtained were that rotifers can be brought back to life after having remained ninety days in a dry vacuum, and having been submitted to the influence of a thirty-minutes' sojourn in an oven heated to 100° Celsius, that is, after having been as completely desiccated as can be. These are precise and accurate facts: the committee remarked, also, that the revivification of Anguillulae may be effected at least twenty-eight years after desiccation; and, following Leuwenhoeck's opinion, M. Broca believed that during desiccation vital phenomena were much reduced, but not wholly suspended. Upon the whole, M. Pennetier's experiments do not give any new result, but they confirm what has already been said. This power of revivification is a very singular one, concerning which a great deal remains to be learned, especially as regards other species. It certainly cannot be believed that desiccated animals which can be re-animated by moisture are really dead: they are in the state called by Preyer *vitae capax*, — a state that is not real actual life, but potential life; a state intermediate between life and death, but much nearer the former than the latter.

A new monthly paper has been recently issued in Paris, of which only two numbers have yet appeared. It is the *Revue de l'hypnotisme*, and is edited by Dr. E. Berillon, with the co-operation of many scientists, such as Bernheim, Hack-Tuke, Grasset, Treland, Luys, Ochorowicz, Magnin, Voisin, Liégeois, and others. M. Berillon has behind him no works to speak for his competency, and is a rather young man. His co-operators are, generally speaking, very able men; but it must be confessed that hypnotism is as yet a rather young science, and requires to be pushed somewhat further before a paper can be usefully devoted to it. The *Revue de l'hypnotisme* contains, however, some valuable contributions, among which we notice especially a paper by Dr. Voisin on therapeutical applications of hypnotism in cases where the disease is more a moral than a physical one. The author relates a case in which hypnotism has been of great use, and has evidently improved the morals of the patient. M. Liégeois contributes an interesting paper on hypnotism induced by telephone: the experiments succeed as well as if the different acts had been directly suggested, without any telephone. These two papers excepted, there is nothing new nor interesting in this young periodical.

M. Molliere of Lyon recently made known an old and very rare book, published a century ago, in which one may find the beginning of Pasteur's theory of pathogenetical germs, or microbes. This book was published at the time of the Marseilles pest, and its title is 'Observations faites sur la peste qui régne a present à Marseille et dans la Provence.' The author was Goiffon, a botanist and physician of Lyon. According to Goiffon, the disease is due to some poison which comes into the body from outside. The poison is believed by him to be some living creature which can multiply without losing its pathogenetic properties. Having never seen any microbes, he considers the cause of the disease as residing in some worm or insect brought from foreign countries with foreign goods. "Measles," says he, "and small-pox, which are recognized as contagious diseases, are perhaps due, as well as many epidemical diseases, to some special sort of little worms, or imperceptible insects, which force themselves into the body of those who become sick, and stick to the clothes of those who propagate the sickness." He believes also that *bovine vert* is "caused by small worms deposited on the hay and grass the herds eat; and the ulcerations that most diseased animals show on the tongue and in the mouth confirm this view." Further on he says that the spread of the disease, when once introduced into a country, is due to the dissemination of the eggs of these worms or insects. The fact that more than a century ago the cause of different contagious diseases was believed to be some living organism, is all the more interesting that it was entirely forgotten. Manget, the Swiss author of many important medical and anatomical works, was the only one who believed in Goiffon's theory; he even remarks that Father Kircher, the well-known scientist and alchemist, had proposed a similar theory. Goiffon's work is a very interesting one, and M. Molliere has done well in republishing this forgotten old book.

MM. Charbonnel-Salle and Phisalix of Besançon have recently published the results of their experiments concerning the pharyngeal and oesophageal secretion of pigeons and other birds, which is used by them to feed their young. It was Hunter who discovered this phenomenon, and first described it. Cl. Bernard compared this secretion with milk, and believed it was caused by a very active cellular multiplication of the epithelium of the oesophageal tract. Other physiologists attributed the secretion to some glands. MM. Charbonnel-Salle and Phisalix show that Cl. Bernard's opinion is correct. They find no glands at all; and the secretion is made up of epthelial cells of the oesophagus. It is known that the edible bird's-nest substance found in the nest of Collocalia nidifica and other swifts, is, on the contrary, the secretion of special glands described by Sir Everard Home in 1817, as Bernstein's and J. R. Green's researches also prove. The origin of the

two substances is entirely different, but it may be that their chemical nature is less different than might be supposed.

Some days ago, in a saloon of Vincennes, about fifty persons were seated at a dining-table. A passer-by would have remarked that they were very quiet. Not a word was said by a single person. As the dishes went around in due order, the passer-by would have thought, after some twenty or thirty minutes, that the meeting was a very ungenial one, or that the assembly was troubled with some mysterious ailment. On walking into the saloon, he would have understood, however, — as the reader perhaps already surmises, — the cause of this silence. The guests were deaf-mutes. No hurrahs, no laughing, no toasts or speeches, that is, in spoken language. But in gesticulated speech a good deal was said. These people are united in a society to celebrate the memory of Abbé de l'Epée, the charitable and devoted instructor of deaf-mutes, and they meet each year to rejoice over their instructor's useful work.

The same day a very amusing meeting was held in Paris by some five or six persons, and attended by a rather large crowd. It was a meeting to protest against Pasteur's method of healing rabies. It is not useful to review all the foolish speeches that were made in this assembly. The public has sufficiently shown what it thinks of them. It was a very funny scene to witness, and one can form no idea of the ignorance and lack of intelligence displayed by the orators. They were perpetually interrupted by the shouts of the crowd, who were intelligent enough to know when truth was spoken, and when error. It is, however, a pity to hear such ignoramuses discuss in such a way scientific questions they do not understand. Sweet Louise Michel was one of the orators, and was well hooted.

A much more interesting and useful meeting was that of the committee appointed to witness M. Marcel Desprez's experiments on the transmission of force by means of electricity. The problem was to take two hundred horse-power at Creil, fifty-six kilometres from Paris, and to deliver half that amount in Paris. In fact, the horse-power in Creil was eighty-eight; in Paris it was forty. Upon the whole, the experiment succeeded well enough, and the results are satisfactory.

Some sensation was recently created here by the application of the law requiring that all professors aged over seventy or seventy-five, if members of the institute, shall be deprived of office, or, as we say here, *mis en retraite*, retired. Among the victims of this law we notice MM. Hardy, Gavarret, and Sappey, of the medical school, and M. Duchartre of the faculty of sciences. M. Hardy is not a lazy man, and he still works a good deal; but all he can do, as his best friends say, is to give a lecture dated 1850. That is very well, but in 1886 science is much advanced, many things having been discovered since 1850. Students require present-day notions, and do not care for old discoveries. M. Sappey is also a conscientious worker; but he teaches anatomy in such a very tedious and uninteresting manner that his retirement cannot be much regretted. As to M. Gavarret, he has not lectured for some years. M. Duchartre has never done any personal original work worth speaking of. He has written a very unpleasant 'Botany,' and that is all. His departure will create no sensation, and students have nothing to lose by the change, whoever may take his place. M. Sappey's place will most likely be filled by M. Farabeuf, a man very well informed on human anatomy, but entirely ignorant of comparative anatomy. M. Gavarret will be succeeded by M. Gariel, an able scientist and very good teacher. It is not known who will take the two other places, but M. van Tieghem, professor at the Museum d'histoire naturelle, might be called upon to teach botany in the Sorbonne. The choice would be a very good one. No choice will be made at present, and, when it is made, I will inform you.

The annual meeting of the Association for the advancement of science is to take place to-morrow at Nancy. A great number of interesting communications are announced, and the volume recording the proceedings at last year's meeting has been issued to-day.

The competition begun some three months ago for fellowships in different medical schools is just over. As usual, the successful competitors for fellowships in anatomy and physiology are surgeons. Surgeons, as a rule, are familiar with anatomy, that is, human anatomy; but they know nothing about physiology, and the lectures they give on the subject are quite insufficient. It is a great pity for the students, and yet more so for the medical schools. There is little yet to be done in anatomy, so they do not do any personal or original work. They go on practising surgery, and are of no use at all to science. In five years, only one real physiologist has been appointed to a fellowship, Ch. Richet; since then only surgeons or anatomists have been appointed. This is a very unfavorable thing for medical schools, and one easily understands the criticism of foreigners, who remark that the fellowships are always obtained by persons who add nothing, or next to nothing, to the stock of human knowledge. The critics are entirely justified, it must be confessed, and it will be necessary to find some remedy for this state of affairs, which is all the

more unsatisfactory because the surgeons who compete for these fellowships do not dare compete for surgical fellowships. Upon the whole, they are not learned enough to depend entirely upon their surgical knowledge. They are neither entirely surgeons nor completely anatomists.

Preparations are being made for the celebration of M. Chevreul's centenary on the 31st of the present month. The National agricultural society is to present him with a gold medal (he has been a member for fifty years), and on the 1st of September there will be a festival tendered him by different persons in the natural history museum. It is not exactly known what will be done, but at all events there will be an exhibition recalling all M. Chevreul's works concerning coloring-matters, dyeing, *corps gras*, candles, glycerine, dynamite, porcelain, and colors. This exhibition is a very good idea, and will meet with great success; for, among the public at large, the notions concerning Chevreul's works are exceedingly vague and uncertain. People all know he is very old, but they do not know how useful he has been, and what service he has rendered to science and industry. In the evening a large dinner will be given, when the ministers of public instruction and of trade will assist, as well as delegates of the faculties and learned bodies, and also delegates representing the branches of industry that have been improved by Chevreul's work. In my next letter I shall have to resume the subject. Many professors and scientists are remaining in Paris to assist at the ceremonial, such as Pasteur, Frémy, Milne-Edwards, Bertrand, Jansen, de Quatrefages, etc.

Yesterday there started for the United States quite a number of travellers of an interesting nature, — a number of splendid horses bought at the last trotting match at Nogent sur Marne by Americans from Illinois, Kansas, Minnesota, Michigan, Wisconsin, etc., for the purpose of keeping up the Percheron breed in America. Your countrymen, such as Messrs. Dunham, Degan, Bowles, and many others, come every year at this time to visit the Perche, and buy the best horses they can find. The medium price is two thousand dollars (ten thousand francs). The first horse so exported crossed the Atlantic in 1839, with Edward Harris of New Jersey. The horses of that breed are very much appreciated still. In 1851, M. Fullington took across the ocean another horse of the same breed; he called it Louis Napoleon, but his friends preferred naming it Fullington's folly. The folly was profitable, however, and the sons of Louis Napoleon are as much valued as those of Philippe Egalité, as Harris's acquisition of 1839 was called. The Percheron stud book is very well kept, only horses born from Percherons in Perche can be recorded. M. M. Dunham, who was here a few days ago, offers each of his stallions some fifty amiable wives, and as each year he buys some three hundred Percherons, one may judge of the importance of his Illinois stud. This year some twelve hundred stallions are leaving France for the States.

The vacations have now begun: most of the professors are out of town. M. Faye was some days ago on the seashore at Villers; Professor Vulpian is in his usual summer resort of Trouville; others are scattered here and there, in mountain or country, or travelling abroad. A great many are in Nancy, for the meeting of the Association for the advancement of science; some are in Germany or elsewhere, awaiting different scientific meetings. It is a happy time for them, and they enjoy a well-deserved rest after a long year's work. V.

Paris, Aug. 11.

NOTES AND NEWS.

THE report of the wide-spread earthquake comes as we go to press. It is probable, that, on account of the extent of country over which the shock was felt, it may be possible to arrive at valuable estimates of the rate of propagation of earth-waves. From Washington we learn that Professor Simon Newcomb furnishes the following figures regarding the earthquake: First shock occurred at 9:53:20; second shock about 9:54:30; lasted until 9:59. Major Powell is quoted as saying that there is a line of weakness in the crust of the earth beginning somewhere south of Raleigh, N.C., and extending in a line along the tidewater, past Richmond, Washington, Baltimore, and Troy, N.Y.; that this line of weakness is marked by a displacement; in some places this displacement being a flexure in the rocks, in other places a fault; and in the neighborhood of this displacement are found the principal waterfalls which constitute the water-power of the Atlantic slope. "It will be interesting," he adds, "to discover the relations of the point of origin of this earthquake to this line of displacement or weakness." The officials of the signal-service bureau report that four distinct shocks were felt there. The first began at 9:54, and lasted 40 seconds; the second shock was felt at 10:04, and was followed by another at 10:10, and by another at 10:30.

— The topographical work of the geological survey is progressing in a most satisfactory manner, and the following summary is given of the results attained up to the first of August. Mr. Natter's party in Massachusetts have finished the Framing-

ham sheet and a large portion of the work north of that place, covering, in all, eighty-five square miles; Mr. Johnson's forces in the western mountainous part of the state have completed forty-nine square miles; Mr. Bodfish's division have finished altogether two hundred and twelve square miles in Massachusetts, one-half of which was partly done last year; of the region around the District of Columbia, thirty-five square miles have been completed; Mr. Griswold has a very large party at work in northern Virginia, who have completed seven hundred square miles; the central division, under Mr. Renshaw, is getting under way; Mr. Davis is at work in central Arizona, and has completed eight hundred square miles; Mr. Wilson is at work in the gold region around Oreville, in the gold belt, with two topographical parties and one triangulation party; the topographical work covers three hundred and seventy-seven square miles, but both parties were retarded somewhat by bad weather. Up to Aug. 27, 53 sheets of the general topographical atlas of the United States have been published; there are 48 sheets in proof.

—The coast-survey parties are now in the field busily engaged in pushing the work forward. Two topographic parties and one hydrographic party are already at work on the resurvey of San Francisco Bay. Owing to the very limited appropriation for the Alaska work (only $4,000 being appropriated in lieu of $9,000 asked for), the steamers especially employed for this work at an expense of several hundred thousand dollars are to be immediately called from the field, there being no money to carry forward the necessary work for which an admirable plant had been provided. Professor Davidson has returned from Portland, Ore., where he was engaged in astronomic and magnetic work, to San Francisco, and has resumed his duties in charge of several parties on the Pacific coast. The parties on the transcontinental arc are all at work except Assistant Eimbeck, who would be in the field were it not for the lateness of the season, which is inopportune for locating stations on the summit of the Rocky Mountains. The telegraphic longitude parties are at Salt Lake and Ogden. Sub-assistant Marr is ordered from the magnetic observatory at Los Angeles to report for duty in telegraphic longitude work at Salt Lake. The physical hydrography of Delaware bay and river has been completed as far as this year's appropriation will carry it, and Assistant Merinden is about to transfer his party to New York bay and harbor, where the work of last summer will be continued. If progress is as rapid as it has been heretofore, the resurvey of Long Island Sound will be completed the present season. Assistant Weir will take up the topographical work in the vicinity of Chatham, Mass., in connection with Professor Mitchell's physical survey of Monomoy Shoals. Mr. F. M. Thorn, superintendent of the coast survey, who left Washington for Orchard park near Buffalo, N.Y., has returned to his official duties.

LETTERS TO THE EDITOR.

***Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.*

'Thumb-marks.'

The letter on 'thumb-marks' in No. 185 of *Science* recalls to mind an extract cut from a newspaper in March, 1883, headed 'Thumb portraits.' The matter was taken from the 'World of wonders.' In it reference is made to the spiral grooves on the skin of the thumb, with the remark that the figure on each thumb remains the same during life, but the marks are different on each. It then goes on to state, "The Chinese take advantage of all this to identify their important criminals, at least in some parts of the empire. We photograph their faces; they take impressions from their thumbs. These are stored away, and if the delinquents should ever again fall into the hands of the police, another impression at once affords the means of comparison. The Chinese say that, considering the alteration made in the countenance by hair and beard, and the power many men have of distorting or altering the actual features, etc., their method affords even more certain and easy means of identification than our plan of taking the criminal's portrait."

A year or more ago a gentleman of Cincinnati proposed to take advantage of this fact, and apply the thumb-mark to railroad tickets, to prevent their falling into the hands of scalpers. He brought it to the attention of several railroad managers, who thought favorably of it; but meeting with considerable difficulty in making arrangements to get the mark without too great inconvenience to the purchaser, and likewise, I believe, discovering that the process could not be patented, it was given up. At least, I have not heard any thing of it lately.

Joseph F. James.

Miami university, Oxford, O.

Revivification.

It is well known by all zoölogists that many animals, such as tardigrades, rotifers, anguillulae, and others, are subject to revivification, as Needham, Spallanzani, Doyère, and others have shown. Could some reader of *Science* tell me whether experiments of a similar nature have been performed in America on these same animals, and let me know the name of the experimenters, as well as the title, date, and place of publication of their papers? I would be also much obliged if any one could tell me whether the experiments have been performed on other animals, of superior organization. Lastly, can some one give me information concerning Hindoo fakirs, who, it is said, can fall into a state of trance, and remain seemingly dead, and in fact buried for a long time,

and come back to actual life again? I have heard this fact spoken of, but I can find no reliable information. Please accompany answers with particulars stated above. V.

Paris, Aug. 14.

Polydactylism.

Dr. LeConte's article on the above subject, in *Science* for Aug. 20, calls to my mind the fact that in my father's family there is a case of non-inherited polydactylism. His parents were normal as to fingers and toes, and so were his paternal grandparents. His eldest brother was born with six well-formed fingers on each hand, the sixth joined very much as described by Dr. LeConte. The extra finger was amputated in childhood. The second child (also a boy) had six fingers on each hand; but the sixth was a rudiment merely, and had no nail. My father was the third child, and, while his fingers were normal, he had six toes — the fifth and sixth at first separate, but now grown together, with two distinct and separate toe-nails, and a distinct suture yet marking the original line of division between the toes. Four other children were born to my grandparents, all of whom are normal in respect to fingers and toes. The eldest son married, and the first child born to him had a bare rudiment of a sixth finger. Several others were born to him, all of whom were normal, and all of whom died in infancy. The second son married, and had six children, all normal so far as fingers and toes are concerned. Two of his children are married, and have normally formed children. My father had eight children born to him, all of whom were normal. My father cannot recollect having heard that any of his ancestors had more than the normal number of digits.

It seems remarkable that three children in succession should be abnormal in this respect, and that only the barest trace of it should appear in the later generations. JOHN B. SMITH.

U. S. nat. mus., Washington.

Barometer exposure.

Allow me space for a brief reply to Mr. 'Gan's' strictures on my letters concerning the influence of the wind on the barometer. He says, "No one that has attempted making a fire in a very cold room, on a very windy day, with a refractory chimney in the foreground, can be easily convinced that there is much of a draught up a cold chimney, even with a hurricane." Exactly, that is just what should be expected in case the wind, in blowing across the chimney and by the room, draws part of the air out, and decreases the pressure inside; for in such cases the mechanical effect of the wind is soon counterbalanced by the differences in pressure between the inside and outside of the room tending to force the air inward, and the draught ceases. If the wind were steady, there might be a slight draught up the chimney (assuming it to be the largest opening) as the air streamed in at the smaller crevices; but the wind is never steady, and, the moment it decreases, down comes the air through the chimney to restore the equilibrium, out streams the smoke into the room, and out goes the half-started fire.

I suspect from his remarks, however, that Mr. 'Gan' is a novice at fire-making. If next winter, when he begins his fire on a windy day, he will open a window or door on the leeward side of the room, he will probably find that the air comes down the chimney, and goes out of the door; but if he will close all of the doors and windows on every side except the windward side, and open one on that side, he will, I think, find a strong enough draught up the chimney, too strong perhaps.

Mr. 'Gan' further says, "It should be noted also that the wind does not blow steadily, but rather in gusts: consequently there can be no such thing as a permanent lower pressure inside than outside a room, but a momentary depression by a gust would be relieved almost immediately by the lull." Mr. 'Gan' speaks here as if a lull were a calm, but this assumption is evidently not true. The lull does slightly relieve the stress on the air in a room, and the pressure immediately slightly rises, to fall again with the next gust. The slight fluctuations have attracted Mr. 'Gan's' attention, though he seems doubtful about their cause. Such fluctuations are very common here, and have a range of hundredths instead of thousandths of an inch, as spoken of by Mr. 'Gan.' They are readily seen to be connected with variations in the wind's velocity, and have been found here only during high winds. Our barograph is of the Draper pattern, and I think responds to rapid changes such as these more rapidly than Hough's.

In regard to Professor Hazen's work, I think Mr. 'Gan' has extended his conclusions beyond those held by Professor Hazen himself. Besides, as previously shown in these letters, Mr. G. K. Gilbert's determinations of the altitudes on Mount Washington by means of the barometer gave the best results when the wind was light or calm, and have been adduced as proof of the effect of the wind.

Mr. 'Gan' suggests that I may have been mistaken in regard to the coincidence between the opening of our trap-door and the changes of pressure in the room, and says, "If his barograph sheet is carried along only two inches a day, opening the trap-door ten minutes will only give one-seventy-second of an inch for the pencil to move in." He hence suggests that it would have been well to have had a companion at the barograph while I manipulated the trap-door. Our barograph sheet moves nearly a foot a day, and we can determine the time interval almost to the minute; but I assure Mr. 'Gan' that I did not publish my first letter until two of us had several times done exactly what he suggested, and thus determined the coincidence between the opening of the trap-door and marked changes of pressure in the room.

The question I think now is, not whether the wind does produce an effect on the barometer, but how may we avoid it? Professor Abbe has recently called my attention to an apparatus suggested by him for this purpose in the chief signal officer's report for 1882, p. 99, and it is hoped that some experiments in this line may be instituted.

H. HELM CLAYTON.

Blue Hill met. observatory, Aug. 23.

Advertised Books of Reference.

SCIENCE.—SUPPLEMENT.

FRIDAY, SEPTEMBER 3, 1886.

PROCEEDINGS OF THE SECTION OF MECHANICAL SCIENCE AND ENGINEERING.

A CONTINUED improvement was manifest in this section, both in attendance and interest, and it may now be considered as fairly established by the side of the older sections, and likely to become one of the largest in the association.

The most valuable paper presented was one on the 'Strength and proportions of toothed wheels,' by Prof. William Harkness of the naval observatory. This paper, of which about half—over 80 p. foolscap—was presented, is the result of a number of years' work of a most varied and exhaustive character. In twenty-three sections it treats of the form of teeth; mathematical theory of the stress on teeth; review of the formulae of previous authors; spur and bevel wheels with iron, brass, and wood teeth; shrouded pinions; sizes of pinions; coefficient of safety; maximum pitch; relation of pitch to face; length of teeth; their thickness; strength of rims; relations between rim and tooth dimensions; sizes and number of arms; naves; keys and bosses; weight and kinetic energy; applications to special cases; recapitulation of formulae; bibliography. In designing clockwork for the transit of Venus and other purposes, the author found no formulae upon which he could rely, those in use giving results widely different from each other, in exceptional cases showing differences of fifteen hundred per cent; he therefore set about determining, in a scientific manner, a formula upon which some reliance might be placed. We have already had occasion to call attention to the remarkable results accomplished when a mechanical problem is attacked in this way. The work of Professor Rogers in developing a method by which precision-screws are economically furnished for machine tools, showed how an astronomer could handle a practical problem, and Professor Harkness has worked by the methods of higher mathematics. He has made and collected a large number of measurements of gears in actual use and of recognized good proportions, and after ascertaining, by the principles of mechanics, the general shape of a correct formula, he has applied the method of least squares to determine the exact form of the same, with the values of the constant terms, which would best agree with these measurements. Over forty authors on the subject are reviewed, from Buchanan, 1808, and Tredgold, 1825, to Redtenbacher, Weisbach, and Reuleaux. One formula, given by Roberton in 1808, was shown to be absurd by Carmichael in 1814, but was nevertheless copied by Farey in 1827, in an excellent work on the steam-engine, and has been in use ever since. Roberton's proof of the formula was that from his experiments he was satisfied he could not be far wrong. In one author, marked, and indeed unlooked-for, advantages appear from the use of the metric system; in a wheel of 2.30 m. diameter, calculated by means of it, the number of teeth is reduced to one tooth 3.21 m. thick and nearly one space. Another uses figures in a demonstration which, interpreted, require that a brass tooth half an inch thick and one inch wide shall carry 13,000 pounds, though the author by mistake got it 130 pounds. 500 representing the safe amount, attention was called to the heavy tooth-stresses of 800 to 900 customary in watches and chronometers, and to that of about 1900 in spring clocks. When put in print, this work cannot fail to be of great and permanent value.

Prof. W. A. Rogers, as chairman of the committee on accurate standards, tools, and methods in the machine shop, gave an account of his work in that direction, and presented a résumé of his experiments in the use of the microscope in connection with machine tools. In this method, dimensions are read through that instrument from accurately divided scales, or, in some cases, determined by calipers or gauges accurately set by means of a comparator. By this system the workman receives from the tool-room of the shop the necessary number of calipers accurately set to the required dimensions by a skilled attendant in charge of the comparator. It is evident that in this way a high and uniform degree of accuracy may be obtained, with much saving of time and avoidance of errors, in which latter respect we would suggest that calipers be returned to the tool-room unchanged, and their settings checked. For all good work, these methods must supercede the present inaccurate and inconvenient use of scales of but moderate precision, and the setting of calipers by the workman, and they will obviate the necessity of the present expensive standard gauges.

The sort of work done by these gentlemen will mark an era in the development of machine construction.

Professor Webb of Hoboken presented his method of determining maximum points and stresses in bridge inclines, which are applicable to trusses of the most irregular form, and to any style of loading, irregular or uniform. The method, as applied to the graphical determination of strains, was illustrated by blackboard sketches and finished drawings, and some of the features of a new notation were explained.

Prof. De Volsen Wood contributed two valuable papers in mechanical engineering. In one of them he showed, by diagram and analytical processes, the application of the equation of 'moment of momentum' to the case of turbines, explaining abstruse points in the action of the latter; in the other, he called attention to the effect of variations in speed upon cylinder condensation, illustrating the same by experimental figures. The section, and indeed the profession, should congratulate itself upon the acquisition of men who bring to their work not only a natural and cultivated knowledge of mechanics, but an intimate acquaintance with and great facility in the use of the higher mathematics. The professor's genius for imparting knowledge is also well known.

The committee on the best methods of teaching mechanical engineering reported that papers would be read upon the subject by a member of the committee and by Dr. Thurston. Professor Alden is an earnest advocate of manual training, and sums up in these four propositions: "Manual processes in education must be primarily for the acquirement of knowledge and discipline;" they "should be such as are adapted to the development of powers, faculties, and habits of mind which have been but little cultivated in the schools;" those "involving the use of tools and construction should be confined to properly designed structures, and should be taught and supervised by experts capable of producing the best quality of standard practical work;" they "should be restricted to those operations for which suitable facilities are provided for carrying out the operations in a practical and thorough manner."

Dr. Thurston outlined the differentiation which has occurred in the profession of engineering, and in engineering schools, defining the titles 'engineer' and 'engineering,' and showing how different the training necessary for each branch of the profession. He called attention, also, to the relation of technical to the ordinary academic education, considering the natural and correct course to be, first, the giving of a general academic, next, a general professional education, and, finally, a special professional training. The usual course has been, too commonly, an attempt to omit real education and to provide only professional training. He thought that the graduate degrees are likely to be, generally, civil engineer, mechanical engineer, mining engineer, etc., etc., and he suggests the conferring of second degrees, if not of the doctorate. The titles 'master in civil engineering' and 'master in mechanical engineering' are already given, and that of 'doctor of engineering' has been given as an honorary degree, no reference being made to the branch in which the recipient labors. The establishment of the latter degree in course is advised.

Dr. Woodward of St. Louis, who has during the past year investigated some of the foreign technical schools, led in the discussion, calling attention to the necessity of using books in connection with manual training exercises to insure a knowledge of the underlying principles. He held also that it is not the amount of instruction that counts, but its quality; and he objected to the attempt to thus train those who are too young to profit fully by it. Dr. Thurston, Professor Wood, and others followed.

Mr. Wm. Kent laid before the society the details of his scheme for an American academy of engineering, which should be composed of the cream of the civil and military, mechanical, mining, electrical, and sanitary engineering societies, with yearly accessions therefrom by regulated and impartial election. It was held that men, organization, and money were all that were needed, and that the first were ready, the second proposed, and the third sure to come. This academy is to be of such high standing as to be the sought authority in all matters of government and civil engineering work, and is to be the custodian of donated and government funds for scientific research, for which purpose expensive and various working laboratories and a library would be required. Many features of the scheme recommended themselves strongly, and such laboratories would doubtless be of immense advantage to the country. The discussion showed marked approval of the scheme, and a valuable suggestion was offered by Dr. Woodward and Professor Webb, to the effect that the granting of masters' degrees to engineers should be in the hands of such a body, in order to protect society from incompetence in these professions. It was felt, too, that the various societies are getting too widely separated, and should in some such manner be brought together.

Dr. Thurston read a paper on the friction of the non-condensing engine. The friction of an engine has been supposed by De Pambour, Rankine, and others, to consist of a constant and a variable part, the resistance of the engine unloaded, the other the increase produced by the fact of its doing work. The last quantity is taken, by De Pambour, as ordinarily about fourteen per cent

of the total resistance due the load. As the result of some experiments, "it is found that the friction of the high-speed non-condensing engine, such as is used in electric lighting, is, under standard conditions, practically constant at all loads, but is variable both with speed of engine, and with steam pressure."

Dr. Thurston exhibited a photograph, and described the great dynamo recently designed by Mr. C. F. Brush, for the Cowles electrical smelting and aluminium company of Cleveland, Ohio, and Lockport, N. Y.

Two papers were read on civil engineering subjects, one with reference to the improvement of harbor and river channels, by Prof. Lewis M. Haupt, and the other upon the difficulties met with in the Panama canal, and the rights which France will be disposed to assume in that connection.

Professor Haupt maintained that all structures of any considerable magnitude and weight, intended to regulate currents, and which rested on, or depended upon, sandy or alluvial bottoms for their support, violated to a greater or less extent the fundamental requirements that they should not oppose the ingress of the tide, nor injuriously modify the currents; also that dikes or jetties were to a great extent below the zero plane or plane of action of waves of translation, and were dependent for their strength upon their mass, and that this was frequently composed of individual fragments of small dimensions, not cemented. It was stated that all such constructions occupy a large volume, produce great pressure and leverage, are wasteful of time and materials, result in serious modification in the regimen of rivers or harbors, are unnecessarily expensive, and if improperly located, they cannot be readily changed. In contrast with this, the professor then suggested a solution, consisting of a floating system of deflectors intended to be attached to buoys or floats, and anchored to heavy moorings, composed of ground chains, held in place by screw discs sunk considerably below the bottom, and proceeded to describe his system.

As a set-off to the papers of more certain value, and perhaps for purposes of recreation, the section listened to a paper detailing observations and experiments, mixed up with some remarkable theories upon the flight of birds, and the serious business of the meeting being over, a last session was devoted to a continuance of the discussion thereon. A letter to the following effect received from a member explains to some extent this action of the section: "In order that this investigation may not be dropped, you may announce that if the gentleman will successfully reproduce before the section the experiments for which he vouches, i.e., if his apparatus, without moving mechanism or outside assistance, supports itself in still air, and moves against a current of air without falling, I will give fifty dollars as a prize for the best paper on the subject, at the next meeting."

An extract from the abstract furnished will also explain to a sufficient extent, for any one acquainted with the laws of mechanics, the supposed peculiar action of gravity in favor of soaring birds. According to the abstract, 'explanations of soaring flight' have been failures, and the 'gravity of the bird's mass' must be resolved 'by the plane of the wings under the law of fluid pressures, and Newton's third law of motion,' in consequence of which 'artificial birds or effigies' 'will imitate the soaring birds,' and 'move against the wind indefinitely!' The abstract concludes with something like a new law in mechanics: "The gravitating force is a continuous motive power when forcing a properly constructed plane to work on air in a certain definite manner, of which the soaring birds are examples." We have often brooded, in that part of our imagination devoted to the figures of mathematics and plus and minus quantities, over the pleasure it would afford to physicists, and ordinary people, could some way be found of changing at will the algebraic sign of gravity or producing negative mass, so that a body might fall upward, but we were scarcely prepared to hear that it could be accomplished by so simple a device as a bird's wing, rough in one direction and smooth in the other, — but the section no doubt needed recreation.

PROCEEDINGS OF THE SECTION OF ECONOMIC SCIENCE AND STATISTICS.

THE programme of this section was popular and varied, as usual, for, besides contributions strictly statistical and bearing upon social and political economics, it is customary to refer to the section all papers which are philosophic rather than technically scientific, or which, although based upon sound science, are in an especially popular form. The casual visitor, after being wearied, puzzled, and confounded in the rooms of the other sections, usually finds in this one something interesting and instructive, and its audiences are largely local in character. The Buffalo sessions have been no exception to the rule. The meetings of this section have been well attended, and while the standard of the papers read has been hardly equal to that of last year, when Mr. Atkinson so well led the way, the average has been good, and the section has been comparatively free from the attacks of socialistic and economic cranks, to which it is especially subject.

Following appropriately the address of Vice-

President Cummings, a paper on 'A more humane and novel mode of criminal correction' was read by John Müller, of Ann Arbor, Mich. The audience was in full sympathy with the criticisms of our penal institutions, and the appeal for a more rational and humane treatment of the younger and hopeful classes of criminals, with a view to their safe restoration; but when emasculation of the intractibles was boldly advocated, and argued by reference to the successful subjugation of brute beasts through castration, no encouraging response met the reader. He well described his own paper as 'a popular subject treated in a very unpopular manner.'

Mr. Müller was more fortunate in his treatment of the question, 'How can spelling reform become a success?' Upon the premise that in rational spelling there should be one sign for one sound and but one sound for one sign, he presented an alphabet of twenty-seven characters, which he claimed sufficient for English wants, and quoted eminent teachers to prove that one-third of the time of the pupil can be saved by use of the phonetic spelling, and that children can be taught to read ordinary compositions in five months. Characters proposed by different persons were shown upon the blackboard, and a lively discussion ensued. A serious difficulty arises in the failure of these reformers to agree upon a system, as unanimous consent is manifestly essential to the successful introduction of such a change. In the discussion it was notable that nearly all the critics of English spelling were foreigners.

'Centenarianism in the United States,' was a masterly analysis, by Joseph Jastrow, of Germantown, Penn., of the statistics on the subject named. In the tenth census, the number of persons aged a hundred years or over is given as 4,016, which was declared absurd, especially as more than three-fourths of these are colored people and more than half of all are colored females. The chief cause of these gross errors is exaggeration, both from ignorance and intent. This exaggeration has been steadily decreasing for a half century, the decennial tables showing a uniform decline, with the exception of 1870, when the freed negroes interrupted the downward scale. There being evidences that the errors accompany illiteracy, the best means of correction is to assume as probably most accurate the ratio of centenarians to the whole population, among the natives in the states of least illiteracy. Combined with this, the author used what he termed the 'decimal exaggeration,' or the excess of the number at a 'round' age, as given by the census, viz., at twenty, thirty, etc., over the number at the next year below, — an excess which the doctrine of 'expectation of life' shows to be impossible. Under this method of correction, one-third of the states with least tendency to error being used as the basis, the number of centenarians is reduced to about one hundred and fifty. Up to this point, the native male whites have been regarded as perfectly reliable. This is evidently not the case, and the estimate is hazarded that inasmuch as only one in twenty-five of the alleged cases in the whole country has proved genuine, *two in three* of the remainder may be doubted, as unintentional errors, leaving but fifty centenarians in the United States, or about one to every million of population. The figures of the census are thus reduced by dividing by eighty, — and this great alteration is sustained by similar researches in England.

'The social waste of a great city' was the title of a long and verbose paper read by Dr. L. L. Seaman, of New York city. The author's experience in ten years' medical service in the city hospitals and charitable institutions led him to vigorously denounce the system of control by city politics, the association of charity with correction in the administrative boards, — claiming that it was erroneous and mischievous to assume a close relation between poverty and crime, — and 'the monopolizing and poisoning' of over six hundred acres of the fine island areas on the front of the city by their present uses. The chief service of this paper was in bringing out a severe criticism by Mr. Edward Atkinson, who took a far more hopeful view of the tendency of the times towards improving the condition of the poor and the lessening of crime in our large cities.

E. B. Elliott, actuary of the treasury department at Washington, presented two papers, mainly tabular and statistical. The titles were: 'Formulas for determining the United States gold value of silver bullion, when the London price per ounce of standard silver and the price of sterling exchange between New York and London are known;' and 'Tables showing for a series of years the rates of interest realized to investors in the securities of the United States government.' The interest tables well illustrate the varying credit of the government, from before the war, to the darkest days of 1864, when lack of confidence and 'fiat money' made the earning-power of the gold dollar 16_2 cents per annum, and then through the period of sounder finance and restored confidence to the present time, when 'governments' yield the holder about $2\frac{1}{4}$ per cent. Mr. Elliott's algebraic formulae for silver values are of limited interest, but may be valuable at times. For a constant numerator, he multiplies the number of grains of fine silver in question (S) by the London price per ounce of standard silver in pence (d),

and this product by the price of sterling exchange, in United States money (E), or $S \times d \times E$, and uses the computed denominator 106.560. The value of a legal-tender dollar and of other silver coins is obtained by other denominators given, — thus, for the dollar, $\frac{d \times E}{387.372}$. On the 6th of August, with silver worth 42d. per ounce in London, our silver dollar was worth in gold bullion 71.21 cents, our trade dollar (full weight), 75.505 cents, and our subsidiary coin, 68.7 cents to the dollar.

'Recent results in the sorghum sugar industry' was the title of a paper by Dr. Peter Collier, of Washington. Numerous comparisons were made between tests of sugar-cane and sorghum, favorable to the latter as a sugar-producing plant. As an illustration, 72 approved varieties of sugar-cane grown upon Governor Warmouth's plantation in Louisiana being examined, averaged 185 pounds of available sugar to the ton of cane. Similar examinations of sorghums by Dr. Collier and Professor Wiley, at the U. S. department of agriculture, including over one hundred varieties, showed the available sugar, per ton of cane, ranging from 177 to 199 pounds. The sorghum also, on the average, produced a lower per cent of glucose and of rejected solids than the sugar-cane, this being also in its favor. As a rule, sorghum yields a less product per acre than cane, but the cost of cultivation per acre is enough less to more than compensate. The great cost of an acre of cane is well known, while sorghum costs not over ten per cent more than a crop of Indian corn of the same area. Chemical results and the manufacture of sorghum sugar, both on an experimental scale and commercially, in Kansas and New Jersey, are such, to date, as to offer every encouragement to this industry. Dr. Collier thinks the record justifies his prediction of the production of sorghum sugar in this country, in the near future, at a cost not exceeding one cent a pound. Dr. Collier also presented, in the form of graphical charts, with brief verbal explanations, 'Statistics relating to the dairy industry.' Compiled from official figures, these charts conclusively disprove the claim that agricultural land and labor, live stock and products, including butter, have suffered depreciation at all disproportioned to the recent general skrinkage in values, because of the introduction of oleomargarine and other butter substitutes and imitations. On the contrary, the number and value of milch cows in this country, and of their pure products, are steadily increasing; and there is now more and better butter made and consumed in America than ever before, while its price, compared with most food products, has been strikingly well sustained.

'The theory of rent, and its practical bearings,' was discussed by Edward T. Peters of Washington, and with such communistic leanings as to meet little approval.

Mrs. John Lucas, of New Jersey, entered a paper upon silk culture, which was received and assigned a place on the programme, but the author failing to appear at the appointed time, the paper was read by title only.

PROCEEDINGS OF THE SECTION OF MATHEMATICS AND ASTRONOMY.

SO MANY important papers were presented in this section, that we cannot even mention them all. Professor Rogers presented two papers, one on the best form of chronograph, and the other, with Anna Winlock, on 'The limitations in the use of Taylor's theorem for the computation of the precessions of close polar stars.'

The next paper was by Professor Doolittle, of Lehigh university, upon a 'Change in the latitude of the Sayre observatory.' In 1877 Professor Doolittle made a zenith-telescope determination of the latitude of this observatory. Nine years later, he now brings forward a new determination of the same latitude, from the same pairs of stars (fifty-seven in number), with about the same number of observations, the two pieces of work being done with the same instrument, by the same observer, and as nearly as possible under exactly the same conditions. No two equally thorough and equally comparable pieces of work with the zenith-telescope have ever been offered as evidence for or against a change in latitude, and the result is interesting. The difference of the two latitudes comes out

$$\phi_1 - \phi_2 = +0''.393 \pm 0''.063,$$

when the probable error of the declinations is used in the weight-coefficients in each case. Or, since the results may be assumed practically free from the errors of declinations, the result is

$$\phi_1 - \phi_2 = +0''.393 \pm 0''.045.$$

In the remarks that followed, Professor Newcomb stated that to him it only meant that in one or both of these series of observations there was — as with every observer and every instrument — some source of small systematic error which 'no fellow could find out.' Mr. Woodward, of the geological survey, an expert with the zenith-telescope, and also in questions of probable error, stated that in the absence of further observations he should hesitate to say that the observations themselves really indicated a real change of latitude.

Dr. Gould read a very interesting historical account of the early attempts at astronomical photography, showing that it originated in this coun-

try, and was for a time most actively pursued here, culminating in those beautiful photographs of the moon taken by Rutherfurd, as well as photographs of several double and multiple stars, and of the clusters Præsepe and the Pleiades. He told how Rutherfurd constructed a micrometer measuring engine, and obtained the first measures of the distances and position-angles of stars upon photographic plates, and how the work was received with considerable skepticism abroad. The speaker then described his own continuation of this same kind of work at Cordoba, and stated that he had brought home plates whose measurement would take a lifetime. Dr. Gould thought that he had the records of many 11th magnitude stars on his plates, the first photographs of such faint stars. Few of the plates were yet measured, and he was becoming solicitous about obtaining the necessary funds to proceed as rapidly as possible with this measurement, as he had detected a tendency, in some of the plates, of the collodion film to become detached from the plates.

A paper by Mr. E. F. Sawyer, entitled 'Some account of a new catalogue of the magnitudes of southern stars,' was presented. Mr. Sawyer has been observing the relative magnitudes of all the stars between the equator and —30°, using an opera-glass with the stars slightly out of focus, and employing Argelander's method. Dr. Gould paid a high compliment to Mr. Sawyer's work, as did also Mr. Chandler.

A paper by Dr. Elkin, of the Yale college observatory, upon 'A comparison of the places of the Pleiades as determined by the Konigsberg and Yale college heliometers,' was presented by Professor Newton. The results given were provisional; but they show unquestioned change of position with reference to η Tauri since 1840. Most of the brighter stars of the group, as shown by Newcomb in his catalogue of 'standard stars' go with η Tauri, but among the smaller stars there are unquestioned departures from this community of proper motion.

In Monday's session a paper by Professor Abbe created some discussion. The point of the paper was, that, as the force of gravity varied from the equator to the poles, thirty inches of mercury in the barometer indicated a less gaseous pressure, and consequently less density of the atmosphere, at the equator than thirty inches at the poles, and hence a correction for latitude should be introduced in allowing for refraction. He showed that, for the difference of latitude of Pulkowa and Washington, it would make 0″.1 difference in the refraction at 45° of zenith-distance, and might be sufficient partly to account for differences in systems of star declinations which depended upon observations at great zenith-distances.

The most important paper in the section, and the one that attracted the most attention and discussion, was by Mr. Chandler, of Cambridge, upon 'A comparative estimate of methods and results in stellar photometry.' We have not space to do justice to this valuable and rather revolutionary paper, but we will try briefly to give its gist. Prefacing his remarks with the statement that it had long been known that small differences of stellar magnitude could be determined very accurately by Argelander's method of steps, by naked-eye estimates, but that it had been generally supposed that large differences could not be accurately so determined, and that the general idea had been that, as soon as photometry came generally into use, and so-called measurement took the place of estimation, a much more accurate scale of magnitudes, depending upon a true geometric light-ratio, would at once take the place of the old, the latter becoming obsolete, Mr. Chandler took for his text the general statement that instrumental photometry had thus far proved a failure; that is, it had not developed a more uniform scale of magnitudes than Argelander's, nor had the accuracy of individual determinations been increased, but they were, on the contrary, far more uncertain than the old differential naked-eye estimates. These statements he proceeded to back up with a convincing array of well-digested results, of which we can only give the briefest summary: 1°. For stars of Argelander's scale between magnitudes 2 and 6, the photometric catalogues of Seidel, Peirce, Wolf, Pickering, and Pritchard differed among themselves as much (or more) in their measures of what Argelander called a difference of one magnitude, as they did in their measures of his successive magnitudes. 2°. Their average values of the logarithm of the light-ratio (we will call it simply light-ratio hereafter, for brevity) for one of Argelander's magnitudes between 2 and 6, ranged between .30 and .38, about .35 for the mean of all the above-mentioned catalogues. 3°. Between magnitudes 6 and 9 of Argelander, the catalogues of Rosén and Ceraski averaged about .35 for the light-ratio, while Pickering's late results with his large meridian-photometer gave (between magnitudes 6 and 8.5) .48 instead of .35 for this ratio. 4°. To show the discrepancies in another way, assume a common light-ratio of .35 for all the photometers, and that their scales agree at magnitude 6. Then, for stars of the second magnitude, they will differ by 0.8 of a magnitude. That is, at a distance of four magnitudes away from where they agree, one photometer will say that the same star is twice as bright as another will. 5°. To test the uniformity of the different scales, all were referred to the average scale of all the photometers, and it was

shown that Argelander's scale in the 'Durchmusterung' was just as close to this as that of any single one of the photometers. 6°. Coming to accidental errors, Mr. Chandler showed that, from a full discussion of the naked-eye estimates of Gould, Sawyer, and himself, the probable error of a single estimate was a little over ±.06 of a magnitude when the stars were at considerable distances from each other, and about ±.05 of a magnitude when near; while the probable error of a single measure in the 'Harvard photometry' was ±.17 of a magnitude, and in the 'Uranometria Oxoniensis' about ±.10 of a magnitude, thus showing that the eye-estimates were from two to three times as accurate as the photometric. 7°. Discussing the cause of the large residuals in the 'Harvard photometry,' Mr. Chandler showed the strong probability of wrong identification of stars in many cases, citing one case where no bright star existed in or near the place called for by the observing-list, on account of a misprint in the 'Durchmusterung,' and yet some neighboring star was observed on several nights for it. 8°. Also the method of applying a correction for the mean value of the atmospheric absorption was very questionable, since overwhelming evidence pointed to an enormous difference in this absorption from night to night. 9°. The author pointed out that we must obtain better results from photometers if we ever expect to use their results for the detection or measurement of variable stars, since several variables have been detected, and their periods and light-curves well determined, by careful eye-estimates, whose whole range of brightness is no greater, or even less than, the range of error in the photometric observations upon a single star with the meridian photometer.

In a discussion of a paper by Mr. Barnard upon 'Telescopic observations of meteor-trains,' Professor Newton pointed out that the study of their drift was the only method we have of studying the upper currents of our atmosphere, except such rare catastrophes as the Krakatoa explosion.

The closing paper was by Mr. Chandler, 'On the use of the zenith-telescope for latitude.'

PROCEEDINGS OF THE SECTION OF BIOLOGY.

THE regular work of the biological section began on Thursday, and a partial classification of the papers into botanical and zoölogical added considerably to the interest and convenience of those present. Some have proposed a divison of the section of biology into botanical and zoölogical sections, but this, with a small meeting, seems hardly desirable, as there are apt to be only enough papers to occupy the time.

Among the first of the botanical papers was one by Prof. W. J. Beal, giving a comparison between the hygroscopic cells of grasses and sedges. In both grasses and sedges, as has long been known, there are one or more longitudinal rows of cells on each leaf, the function of which is to fold or close the blade in times of drought, and thus prevent too rapid evaporation of moisture from the surface. These rows of cells, as well as the cells themselves, vary in shape, size, and distribution in the different genera and species, and may have some value in the discrimination of critical species. The most interesting point brought out was, that many parallels exist between the genera of grasses and sedges in the arrangement of these hygroscopic, or, — as Professor Beal chooses to term them, — bulliform cells.

The paper of Messrs. J. M. Coulter and J. N. Rose, giving a synopsis of the North American pines, based on leaf-structure, had some points in common with the one just mentioned, and was of especial value from a systematic stand-point, from the fact that any species in this somewhat difficult group can at once be distinguished by the peculiarities of its minute leaf-structure; and the results of the author's observations are shown to be worthy of attention from the fact that a classification based on these characters is, in its broader features, closely like that of the late Dr. Engelmann, which, as is well known, took into consideration the whole tree.

The relations of germs to disease naturally occupied a prominent place in the proceedings of the section, and the presence of over half a dozen investigators in this line made the discussions interesting. Dr. D. E. Salmon read two papers bearing on the causes of immunity from a second attact of germ diseases. There are three possible explanations: 1°, something is deposited in the body during the attack which is unfavorable to the germ; 2°, something has been withdrawn which is necessary to its development; 3°, the tissues have acquired such a tolerance for the germ or for an accompanying poison that they are no longer affected by it. Dr. Salmon favored the last view, and gave details of a large number of experiments to substantiate his opinion. He said that Metchinkoff's phagocyte theory was not wholly satisfactory, and that large doses of the germs were more powerful than small ones. He attributed their action to a poison which was a result of their growth, and thought that a large dose had a greater effect because the poisons benumbed or killed the cells, thus giving the bacteria a better chance to grow and to thus produce more poison.

Dr. Joseph Jastrow gave an account of some

physiological observations on ants, in which he was able, by simple but ingenious means, to study the rate of walk of these insects, and stated that his results, so far as they went, confirmed the opinions of others that the smaller the animal the more rapid the step, and also the more quickly fatigue was produced. Dr. Jastrow also had some observations on the dreams of the blind, taken mostly from persons who had lost the sense of sight before the age of five. In these cases the dreams were all in terms of hearing. In the case of Laura Bridgeman, the dreams were apparently based on touch. In persons who become blind between five and seven, sight terms played an important part in dreams. The relation of these facts to the development of the sight centres was pointed out.

A short paper by S. H. Gage and Seth E. Meek, on the lampreys of Cayuga Lake, stated that the large lamprey, heretofore regarded as sub-specifically distinct, was identical with the well-known sea-lamprey of the Atlantic coast, the characters separating it being of a sexual nature and assumed at the breeding season. The existence of a second species in Cayuga Lake, hitherto not known east of Indiana, was mentioned. The authors described the method of nest-building, stating that the lampreys seek out a spot in the still water above the ripples, and then, by means of their sucking mouths, remove the stones until a nest from four to eight inches deep is made. In the sand in the bottom of this nest the eggs are laid. The time of oviposition was from June 9 to July 6 during the present year. The pile of gravel thrown up in making the excavation is not the nest, but later it is found to be occupied by the ammocoete larva.

The most important feature of Dr. Kingsley's account of the embryology of the shrimp (Crangon) related to the development of the compound eye. Locy was the only previous observer of the early stages of the eye of anthropods, and Dr. Kingsley's observations confirmed his results as well as going more into detail.

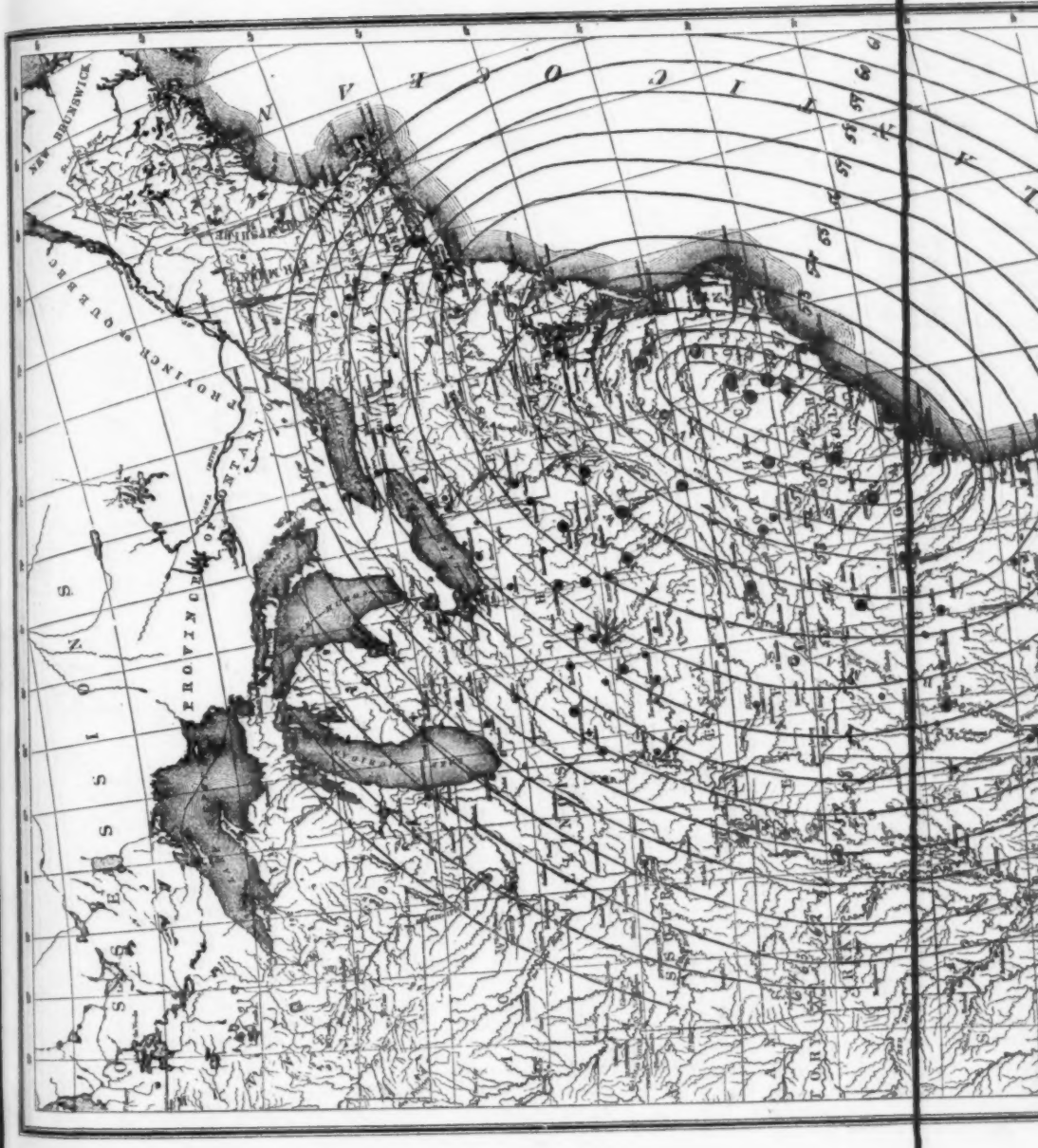
Dr. C. S. Minot, in his paper on the segmentation of the vertebrate ovum, reduced all types of segmentation to a common basis, and clearly pointed out the homologies. The most important point was that which showed that the majority of authors had confused the germ-layers in the mammalian ovum, and have termed the entoderm, ectoderm, and *vice versa*. On Dr. Minot's showing, the difficulties encountered in mammalian embryology are largely those of misconception and misinterpretation.

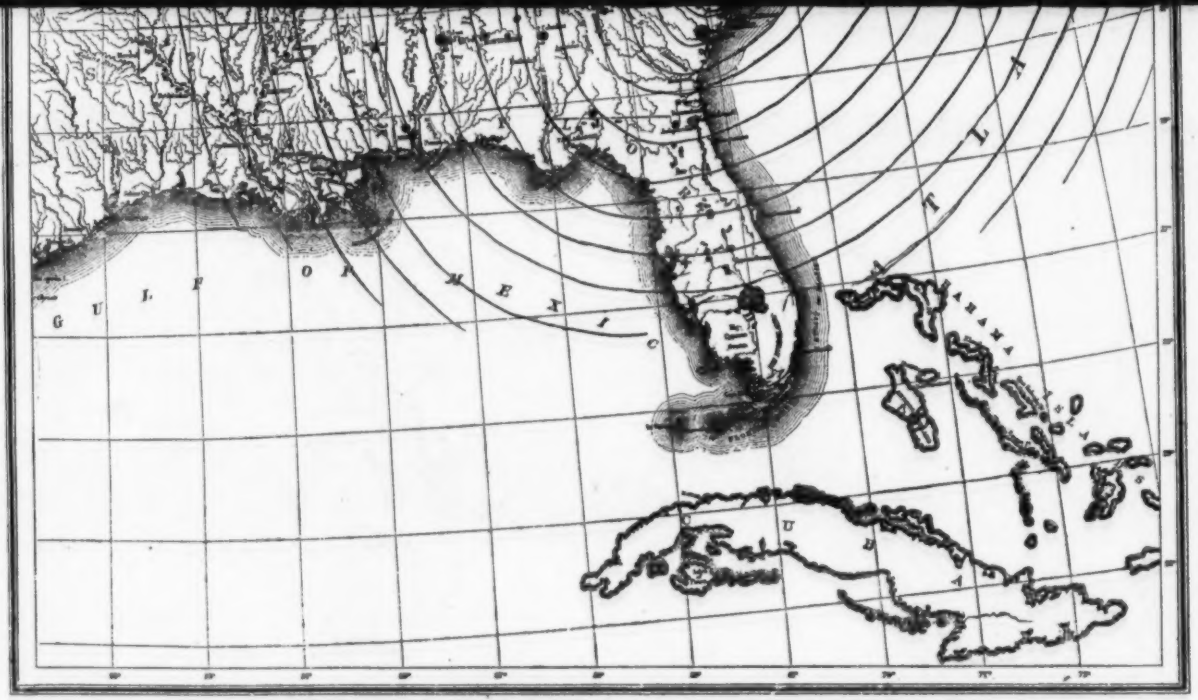
Dr. Merriam, after mentioning the fact that bats might be divided into tree-dwelling and cave-dwelling forms, presented evidence, of a negative character, which goes to show that the tree-inhabiting bats migrate. No woodsmen have found bats in hollow trees in winter, and there is no evidence that any forms hibernate. In a second paper the same gentleman gave an outline of the work being done in the department of agriculture, on economic ornithology and mammalogy, in which he pointed out, in most vigorous language, the immense damage done the agricultural interests by the bobolinks and English sparrows. One South Carolina planter with rice-fields of twelve hundred acres employed each year a hundred persons to kill the birds, at a total expense for ammunition, etc., of $4,500.

Among the papers read were the following: 'Culture experiments showing accidental relations between Gymnosporangia and Rolstelia,' by Dr. W. G. Farlow; 'Insect diseases,' by Prof. S. A. Forbes; 'Areas of form and color perception of the human retina,' by Prof. J. H. Pillsbury; 'Development of the human chorion,' by Dr. C. S. Minot; and, 'The auditory bones in the lower vertebrates,' by Prof. E. D. Cope.

Musk is an animal substance, obtained from an abdominal sac of the male of the Moschus moschatus, a small hornless deer inhabiting the higher mountains of central Asia, ranging from Thibet to China, and into Asiatic Russia. The contents of the musk-sac are a solid, brownish, granulated, ovoid mass, exceedingly strong and tenacious in odor, and varying in size from that of a walnut to that of a hen's egg. There are four varieties of musk, viz.: Tonquin, from China, regarded as the best, and which is looked upon as the most recherché; Yunnan, from the frontiers of Indo-China; Assam, or Bengalee; and, least valued of all, Kabartin, from Tartary and Siberia. Musk is very expensive, the price at present ranging from eight to twenty dollars per ounce, in the pods or bags, according to grade. This high price is the cause of much adulteration, in this country as well as at the place of production; so that there is very little in the market that can be considered pure. The principal adulterants are lead, iron, coagulated blood, leather, stones, and even paper and rags. The adulterant is inserted in the bag, and the opening closed in such a manner as to defy detection. About five hundred pounds of musk are used annually in the United States, of which ninety-five per cent goes into toilet soaps and perfumery, the rest being used for medicinal purposes.

— Prof. John Dickinson, a brother of Miss Anna Dickinson, has accepted the chair of geology and mineralogy in the University of Southern California at Los Angeles.


NEW BRUNSWICK
QUEBEC
ONTARIO
MICHIGAN
ILLINOIS
INDIANA
OHIO
KENTUCKY
TENNESSEE
MISSISSIPPI
ALABAMA
GEORGIA
SOUTH CAROLINA
NORTH CAROLINA
VIRGINIA
WEST VIRGINIA
PENNSYLVANIA
NEW YORK
MAINE
VERMONT
NEW HAMPSHIRE
MASSACHUSETTS
RHODE ISLAND
CONNECTICUT
NEW JERSEY
DELAWARE
MARYLAND
ATLANTIC OCEAN
GULF OF MEXICO



THE CHARLESTON EARTHQUAKE.

The co-seismal lines give the even minutes after 9 P.M. (75th meridian time).

Scale of intensity, 1 to 5.

+ indicates that the shock was unimportant, or not felt.

Diameter of circles (in ½ mm.) gives American scale of intensity (1 to 5).

SCIENCE, September 10, 1886.